STUDIES ON STORAGE OF ORCHID POLLEN

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ABSTRACT

A practical way to store orchid pollen for a year to aid breeding program hindered by the difference of flowering times was investigated in Dendrobium phalaenopsis, D. undulatum, D. strebloceras, an amphidiploid D. phalaenopsis x D. gouldii, and Oncidium stipitatum. After viability test at harvest, pollen was stored at 45°F and 72°F with and without dehydrants using silica gel or calcium chloride. The viability was tested by germinating pollen grains on 5 percent agar-sucrose medium at 2, 4, 6, 8, 10, and 12 months storage periods. Pollen stored better without dehydrant at both temperatures. Except D. phalaenopsis whose pollen lost viability after 4 months, all orchid pollen retained their viability for a year when stored at 45°F with no dehydrant.

INTRODUCTION

The first orchid hybrid was made between Calanthe masuca and Calanthe furcata in 1852 by John Dominy of England. Since that time many interspecific and advanced generation hybrids have appeared. According to Hawkes (1961) the number of orchid hybrids have been increasing in recent years at the rate of 1,000 each year. Because of the great number and diversity of orchid species, breeding of orchids will probably continue to be rewarding.

In order to perform cross-pollination of orchids under normal conditions, two plants have to flower simultaneously. Many orchid species and hybrids flower at a specific time of the year, and their flowering periods may not coincide. Control of flowering in orchid is difficult. An alternative means of facilitating pollination of two plants flowering at different times of the year is pollen storage.

The literature on storage of orchid pollen is limited. Withner (1959) states that "hardly more than initial conventional studies of pollen germination and longevity have been made, and yet their pollen is of distinct interest for the length of time it may be stored and remains viable". According to Northen (1962) orchid pollen may be stored for at least six months, but does

not remain viable as long as orchid seed. More recently Ito (1965) showed that long term storage of orchid pollen was possible by placing pollinia in a vacuum bottle and keeping them in ultra-low temperature of -79°C. This method, however, does not seem to be practical for most orchid breeders.

The major objective of the present investigation was to establish a practical method of storage of orchid pollen. Since most orchid plants can be expected to flower at least once a year, by successfully storing pollen up to a year a wide number of cross-pollinations may be performed and thereby greatly aid a breeding program.

REVIEW OF LITERATURE

Studies on the storage of pollen was started near the end of the nineteenth century by Mangin (1886), Rittinghaus (1886), and Molisch (1893). The investigations made on over 80 species to determine the longevity were mainly under air-dry condition at room temperature. An extensive review of literature on the systematic investigation of pollen storage and viability was reported by Visser (1955). Reviews pertinent to the storage of pollen covering several hundred genera were made by Pfundt (1910), Knowlton (1922), Holman and Brubaker (1926), Doroshenko (1928), Nebel and Ruttle (1937), Maheshwari (1944), and Singh (1961).

The longevity of stored pollen has been investigated mainly in relation to relative humidity, temperature, and nutrient media. Crawford (1937) found that the pollen of date palm kept at room temperature was useless after a year, but it remained viable for a longer duration when kept under cold storage at $8^{\circ}F$. Nebel and Ruttle (1937), in a study of pollen life of apple and cherry, reported that the life of the pollen stored at $2^{\circ}C$ to $8^{\circ}C$ was more than 2 years. The relative humidity was 50 percent.

The humidity of the air during storage plays a decisive role on the longevity of pollen and the majority of pollen maintained their vitality only at low relative

humidity (Linskens, 1964). Pfundt (1910) investigated the effect of 0, 30, 60, and 90 percent relative humidity on the viability of the pollen of 140 species at 17°C and 22°C. From this investigation the maximum longevity was obtained at low relative humidity ranging from 0 to 30 percent. Similar results were also obtained by Holman and Brubaker (1926) who tested the viability of pollen of 52 species at the above temperatures and at 0, 27, 63, and 92 percent relative humidity. The air-dry preservation for pollen storage was also recommended by Molisch (1938). According to Linskens (1964) not only was temperature resistance increased with the decrease of water content of the pollen but also the resistance to poisons and mechanical injuries.

The maximum longevity of maize pollen was found by Knowlton (1922) when kept at 50 to 80 percent relative humidity and dessication was the important factor causing early death of pollen during storage. However, the longevity generally increased with the reduction of relative humidity during storage (Linskens, 1964), and in special cases water content of pollen could not be brought below a critical level since in these cases a high water content was indispensable for longevity. A rapid decrease of vitality took place as a result of rapid loss of water, and the humidity above the optimal level

did shorten the life of pollen as a result of increased physiological activity. Bullock and Snyder (1946) also found that when the relative humidity was allowed to fluctuate frequently during storage, viability was lost rapidly.

In the study of the relationship of temperature and relative humidity to pollen longevity in Prunus, Pyrus, Pistacia and Cynodia, King and Hesse (1938) reported that the optimum storage conditions were a temperature of 36°F and relative humidity of 25 percent. Nebel (1939) was also able to store pollen of apple, pear, plum, peach, apricot, and sour cherry over sulfuric acid in a dessicator with 50 percent relative humidity at 2°C to 8°C. Grape pollen was maintained at 21 percent viability for 4 years at -12°C and 28 percent relative humidity by Olmo (1942). Similar pollen longevity studies were conducted in cherry by Pfundt (1910), in papaya by Traub and O'Rork (1936) and Singh (1961), and in Pistacia by Stone et al. (1943). In order to retain viability for prolonged periods, Johri and Vasil (1961) suggested the ideal conditions as being a near-freezing temperature and a relative humidity of 25 to 35 percent.

Deep freezing might be used successfully to store some pollen types almost indefinitely (Griggs et al.,1953 and Visser, 1955). King (1961) subjected pollen of a

number of species and varieties including fruit tree species, tomatoes, onions and sugar cane to freeze-drying at a temperature of -60°C in a vacuum of 50 to 250 mm of mercury. After a certain time the vacuum was released and the pollen stored in nitrogen gas in a sealed bottle or tear bulb at room temperature or low temperature. To induce germination the pollen was kept at 5°C and 60 percent relative humidity. The data showed that pollen retained a high percentage of germination for a long period following freeze-drying and storage in an inert gas at low temperature storage was beneficial. Earlier experiments on storage have also shown that pollen was not damaged by temperatures ranging from -10°C to 35°C (Linskens, 1964).

Common dehydrating agents used in pollen storage are calcium chloride and silica gel, though sometimes sulfuric acid and cotton wool are employed. In a study on the pollen longevity of Poncirus trifoliata, Sawano (1954) reported a viability of 110 days of pollen stored over calcium chloride. The most effective method of preserving the viability of oil palm pollen was found by Devreux and Malingraux (1960) to be drying in a dessicator over calcium chloride or, preferably, silica gel to a moisture content of about 15 percent. Pollen so treated and then sealed in test tubes retained adequate

viability for a year. Benoit (1961) satisfactorily stored pollen of oil palm, Elaeis guineensis Jacq., at 5°C over silica gel. Pollen of cacao was stored in glass tubes over calcium chloride at the temperature of -25°C to 30°C for 1 to 4 weeks by Soria and Denys (1961). Subsequent germination in an agar-dextrose medium was low, but field pollination gave 40 to 50 percent fruit set. Their findings agree with those of Varas and Bullard (1960) who suggested the two best methods of storing cacao pollen by storing flowers with calcium chloride at 5°C, or with cotton wool at -20°C. Damsey (1966) stored pollen under 3 different conditions. Pollen stored over calcium chloride remained viable for 50 days.

The commonest and most reliable methods of determination of pollen viability are in vitro and in vivo germination tests. Viability is also indicated by fruit set after pollination. Both tests need not give identical results (Visser, 1955). In spite of the difficulties in obtaining valid data considerable work has been done in the development of media and conditions suitable for the in vitro germination of the pollen of many species of plants. Generally the pollen grains are sown directly onto the surface of a solution of sucrose, either with or without the addition of solidifying agents such as agar. The media are usually sterilized but no attempt is made

to sterilize the surface of the pollen grains (Curtis and Duncan, 1947).

Pollen of some plants may germinate easily under a wide range of conditions, while in others the requirements may be very exacting. Normally pollen grains do not germinate satisfactorily in water, but aqueous solutions, with or without supplementary substances, produce good results (Johri and Vasil, 1961). Brink (1924) added a small amount of a yeast extract to the basal medium and increased the germination. The germination of a fruit tree pollen was also increased several hundred fold with the addition of boron (Curtis and Duncan, 1947). Cooper (1939) found that the addition of riboflavin and ascorbic acid to the medium increased the germination of papaya pollen. Thiamine chloride, nicotinic acid, indoleacetic acid and the hydrochlorides of several amino acids were also active in pollen germination (Singh, 1961). Addicott (1943), Johri and Vasil (1961), and Smith (1939, 1942) have shown that a wide range of substances may be effective in inducing pollen germination. In recent years, the effect of a variety of supplementary growth substances, such as vitamins and hormones, on pollen germination has been determined.

One percent agar medium with 15 percent sugar was found by Benoit (1961) to be the optimum for the

germination of oil palm pollen, but for citrus pollen Deidda (1960) showed that 20 percent sucrose in the medium produced good germination. Portjanko and Kudrja (1966) reported that halogens and their salts at 0.001 and 0.005 percent added to a sugar-agar medium stimulated pollen germination and pollen tube growth in many fruit tree species and some vegetables. Br, I, and F had a greater stimulating effect on pollen germination than such stimulants as naphthylacetic acid, succinic acid or boric acid.

Studies on pollen longevity of orchids are few. Molisch (1893) determined the optimal sugar concentrations of 6 tropical species. In his general studies on longevity of pollen, Pfundt (1910) included the pollen of 2 European temperate species. He found that storage of pollen over sulfuric acid increased longevity from the air-dry value of 40 days to about 120 days. Curtis and Duncan (1947) studied pollen germination in 11 species of tropical orchids under artificial conditions but did not attempt to study the longevity of them. In a study on ultra-low temperature storage of orchid pollen and seeds, Ito (1965) suggested storing orchid pollen in vacuum bottles at -79°C with 99 percent ethyl alcohol and dry ice as refrigerant.

The earliest studies of germination of orchid pollen were those of Molisch (1893) who determined the optimal sugar concentrations, and Miwa (1937) who germinated orchid pollen on a synthetic medium with the use of 5 percent sugar solution solidified with agar. Curtis and Duncan (1947) found that for the pollen of Cattleya intermedia the most favorable concentration of sucrose in the medium was 0.1 and 0.2 molar or 2.5 and 5.0 percent sucrose. They concluded that for most species tested good germination can be obtained within 36 hours on an agar medium containing 0.2 molar sucrose at pH 4.8 at a temperature of 28°C.

MATERIALS AND METHODS

Five kinds of orchids were selected for the present investigation. These were Dendrobium phalaenopsis, D. undulatum, D. strebloceras, an amphidiploid D. phalaenopsis x D. gouldii, and Oncidium stipitatum.

Pollinia were collected and placed individually in small gelatin capsules. The capsules were then placed in 150 ml sealed jars with or without the dehydrating agents, silica gel and calcium chloride. The quantity of each dehydrating agent used was approximately 10 percent of the total volume of the jar. The pollinia were stored at two temperatures, 45°F and 72°F, for periods of 2, 4, 6, 8, 10, and 12 months. Each treatment was replicated 3 times with the exception of those involving D. phalaenopsis which were replicated twice due to insufficient pollen.

The viability of pollen was determined by germinating it on synthetic medium. The components of the medium were 5 gm cane sugar, 1 gm bacteriological agar, and 100 ml distilled water. The medium was prepared by dissolving 5 gm cane sugar in 100 ml distilled water and warming gently until the solution boiled. Agar was added and the solution stirred until it had a uniform consistency. The medium was then poured into small Petri dishes to form a layer about 2 mm thick. Since aseptic conditions were required, the culture dishes were then autoclaved at 121°C under 15 lb

pressure for 30 minutes. This process reduced fungal and bacterial contaminations.

The pollinia were placed on the medium and stored at 72°C in darkness as recommended by Miwa (1937) for 3 days. Dendrobium pollinia started to germinate after 36 hours, but were analyzed after 72 hours. Portion of a pollinium was transferred to a microscope slide and examined under the microscope at the magnification of 45 x 10. Clumped germinating tetrads were disregarded in analysis to eliminate error in counting. Dyads and triads also were not used in the analysis. From each smear 100 tetrads totaling 400 pollen grains were counted, and the number of pollen tubes from each tetrad (0 to 4) was recorded.

The results obtained were statistically analyzed utilizing factorial design (Snedecor and Cochran, 1967). Also single comparisons were made.

RESULTS AND DISCUSSION

The percent germination of the pollen of 4 orchid species and one amphidiploid at time of harvest and after varying storage periods is presented in Table I to VI. The percentage of pollen germination of all orchids at time of storage ranged from 71.5 to 95.0, indicating that pollen used in the storage test was viable (Table I).

Dendrobium phalaenopsis pollen stored at 45°F gave 66.7 and 32.6 percent germination after 2 and 4 months of storage respectively with no dehydrant (Table II). On the other hand, those stored at 72°F gave 36.5 and 12.2 percent germination respectively after 2 and 4 months, indicating beneficial effects of the lower temperature storage. The viability of pollen of D. phalaenopsis was lost completely when stored with calcium chloride or silica gel at 45°F or 72°F.

Dendrobium undulatum pollen stored without dehydrant gave 83.0, 77.8, 72.0, 71.4, 57.1, and 60.0 percent germination after 2, 4, 6, 8, 10, and 12 months storage respectively at 45°F (Table III). At 72°F without dehydrant, the germination was comparable to those at 45°F up to 6 months after which the percentage declined. At 12 months the germination dropped to 26.0 percent. Those stored at 45°F with silica gel and calcium chloride gave 26.8 and 42.4 percent germination after 2 months of

TABLE I. PERCENT GERMINATION OF POLLEN OF 5 ORCHIDS IMMEDIATELY AFTER HARVEST

NAME OF ORCHID	PERCENT POLLEN GERMINATION
D. phalaenopsis	71.5
D. undulatum	85.0
D. strebloceras	95.0
D. phalaenopsis x *D. gouldii*	72.3
O. stipitatum	83.5

TABLE II. PERCENT GERMINATION OF POLLEN OF DENDROBIUM PHALAENOPSIS STORED WITH AND WITHOUT DEHYDRANT AT 2 TEMPERATURES AND 6 STORAGE PERIODS

Period of storage (months)	45°F			72°F		
	No dehydrant	Silica gel	Calcium chloride	No dehydrant	Silica gel	Calcium chloride
2	66.7	0	0	36.5	0	0
4	32.6	0	0	12.2	0	0
6	0	0	0	0	0	0
8	0	0	0	0	0	0
10	0	0	0	0	0	0
12	0	0	0	0	0	0

TABLE III. PERCENT GERMINATION OF POLLEN OF *DENDROBIUM UNDULATUM* STORED WITH AND WITHOUT DEHYDRANT AT 2 TEMPERATURES AND 6 STORAGE PERIODS

Period of storage (months)	45°F			72°F		
	No dehydrant	Silica gel	Calcium chloride	No dehydrant	Silica gel	Calcium chloride
2	83.0	26.8	42.4	83.9	0	0
4	77.8	0	0	82.9	0	0
6	72.0	1.8	1.6	81.4	0	0
8	71.4	1.7	0.5	63.1	0	0
10	57.1	0	0	57.4	0	0
12	60.8	0	0	26.0	0	0

storage, but longer storage periods adversely affected viability. Evidently the high degree of dessication of pollen greatly reduced the viability. At 72°F no germination was obtained from pollen stored with either silica gel or calcium chloride.

The percent germination and longevity of pollen of Dendrobium strebloceras are shown in Table IV. At 45°F without dehydrant the percent germination was 90.4, 84.1, 87.5, 82.0, 82.5, and 84.2 after 2, 4, 6, 8, 10, and 12 months of storage respectively. At 72°F the germination percentages were 96.0, 87.3, 84.3, 74.6, 28.1, and 4.7 at the respective periods of storage. The results were somewhat comparable to those obtained for D. undulatum. At 45°F pollen viability was excellent after 12 months of storage, but at 72°F the percent germination dropped appreciably after 8 months of storage. The germination percentage of pollen stored with silica gel or calcium chloride as dehydrants at both 45°F and 72°F did not give as high a percentage as pollen stored without dehydrant.

Table V presents the results obtained for the amphidiploid Dendrobium phalaenopsis x Dendrobium gouldii. Pollen stored at 45°F with no dehydrant gave 76.7, 70.1, 70.0, 68.0, 60.0, and 46.6 percent germination after 2, 4, 6, 8, 10, and 12 months of storage respectively. Those

TABLE IV. PERCENT GERMINATION OF POLLEN OF DENDROBIUM STREBLOCERAS STORED WITH AND WITHOUT DEHYDRANT AT 2 TEMPERATURES AND 6 STORAGE PERIODS

Period of storage (months)	45°F			72°F		
	No dehydrant	Silica gel	Calcium chloride	No dehydrant	Silica gel	Calcium chloride
2	90.4	48.6	62.8	96.0	19.2	9.7
4	84.1	32.8	33.5	87.3	15.6	9.8
6	87.5	24.6	25.0	84.3	21.9	16.5
8	82.0	13.2	10.3	74.6	9.1	1.9
10	82.5	0	1.5	28.1	0	0
12	84.2	0	0	4.7	0	0

TABLE V. PERCENT GERMINATION OF POLLEN OF DENDROBIUM PHALAENOPSIS x DENDROBIUM GOULDII STORED WITH AND WITHOUT DEHYDRANT AT 2 TEMPERATURES AND 6 STORAGE PERIODS

Period of storage (months)	45°F			72°F		
	No dehydrant	Silica gel	Calcium chloride	No dehydrant	Silica gel	Calcium chloride
2	76.7	0	3.5	34.9	0	0
4	70.1	0	0	65.0	0	0
6	70.6	0	0	0	0	0
8	68.0	0	0	0	0	0
10	60.0	0	0	0	0	0
12	46.6	0	0	0	0	0

stored with silica gel at the same temperature did not germinate at all, while those stored over calcium chloride gave 3.5 percent germination after 2 months of storage, and no germination after that period. Pollen of this hybrid stored at 72°F did not yield satisfactory results as compared with those stored at 45°F. Pollen stored with no dehydrant gave 34.9 and 65.0 percent germination after 2 and 4 months period of storage respectively, but no germination occurred thereafter. No germination was obtained from pollen stored with silica gel and calcium chloride as dehydrants. The difference in germination of pollen stored with and without dehydrants was very distinct in this orchid hybrid. Also it was clearly evident that the viability of pollen was better when stored at 45°F without dehydrant than at 72°F.

Pollen longevity of Oncidium stipitatum investigated in the present study was even more contrasting (Table VI). Pollen stored at 72°F did not germinate either with or without dehydrating agents. On the other hand, pollen stored at 45°F gave 84.6, 81.0, 65.3, 69.2, and 56.1 percent germination after 2, 4, 6, 8, 10, and 12 months of storage without dehydrants. Those stored with silica gel did not germinate while only 6.6 percent germination was obtained after 2 months from pollen stored with calcium chloride. Those stored for longer periods with

TABLE VI. PERCENT GERMINATION OF POLLEN OF ONCIDIUM STIPITATUM STORED WITH AND WITHOUT DEHYDRANT AT 2 TEMPERATURES AND 6 STORAGE PERIODS

Period of storage (months)	45°F			72°F		
	No dehydrant	Silica gel	Calcium chloride	No dehydrant	Silica gel	Calcium chloride
2	84.6	0	6.6	0	0	0
4	81.0	0	0	0	0	0
6	65.3	0	0	0	0	0
8	64.9	0	0	0	0	0
10	69.2	0	0	0	0	0
12	56.1	0	0	0	0	0

calcium chloride did not germinate. Apparently pollen of O. stipitatum must be stored at relatively low temperatures. At 45°F the pollen can be stored effectively for a year.

The results of the present investigation revealed that pollen stored without dehydrating agents showed higher viability compared with those stored with dehydrating agents. The reduced viability due to storage with dehydrants might be attributed to excessive dehydration of the pollen. Perhaps better results might have been obtained if lesser quantities of the dehydrants were used.

Since the results clearly indicated that storage of orchid pollen was better without dehydrating agents, germination percentages of pollen of 4 different orchids stored without dehydrating agent at 2 temperatures and 6 storage periods were compared (Table VII). Differences due to kind of orchid, temperature, and period of storage were highly significant. Figures 1 to 4 show graphically the relationship of temperature and storage period on pollen germination for D. undulatum, D. strebloceras, the amphidiploid D. phalaenopsis x D. gouldii, and O. stipitatum.

With the exception of D. phalaenopsis, the pollen of all orchids stored at 45°F retained their viability for

TABLE VII. PERCENT GERMINATION OF POLLEN OF 5 DIFFERENT ORCHIDS STORED WITHOUT DEHYDRANT AT 2 TEMPERATURES AND 6 STORAGE PERIODS

Species	Period of Storage (Months)											
	2		4		6		8		10		12	
	45°F	72°F	45°F	72°F	45°F	72°F	45°F	72°F	45°F	72°F	45°F	72°F
D. phalaenopsis	66.7	36.5	32.6	12.2	0	0	0	0	0	0	0	0
D. undulatum	83.0	83.9	77.8	82.9	72.0	81.4	71.4	63.1	57.1	57.4	60.8	26.0
D. strebloceras	90.4	96.0	84.1	87.3	87.5	84.3	82.0	74.6	82.5	28.1	84.2	4.7
D. phalaenopsis x D. gouldii	76.7	34.9	70.1	65.0	70.6	0	68.0	0	60.0	0	46.6	0
O. stipitatum	84.6	0	81.0	0	65.3	0	64.9	0	69.2	0	56.1	0

a period of 12 months which is an adequate period of storage for an effective orchid breeding program, since new pollen can usually be obtained each year. At this temperature there was very little fluctuation in the percent germination over the entire storage period, although there was a slight drop in germination toward the longer storage periods. The longevity of D. phalaenopsis was only 4 months at either storage temperature. The germination percentages of D. undulatum pollen stored at 45°F and 72°F did not differ until the twelfth month (Figure 1). Those of D. strebloceras, however, showed no significant differences during the first 8 months of storage, but germination of pollen stored at 72°F dropped considerably after 8 months while those at 45°F retained more or less the same germination percentage (Figure 2). Thus for both D. undulatum and D. strebloceras pollen can be stored effectively for 12 months at 45°F and for 8 months at 72°F.

The same germination results of the amphidiploid D. phalaenopsis x D. gouldii (Figure 3) is of considerable interest since one parental species, D. phalaenopsis, has exhibited poor viability in storage (Table II). The other parental species, D. gouldii, is closely related to D. undulatum and D. strebloceras, which showed excellent pollen keeping qualities. As seen in Figure 3 germination

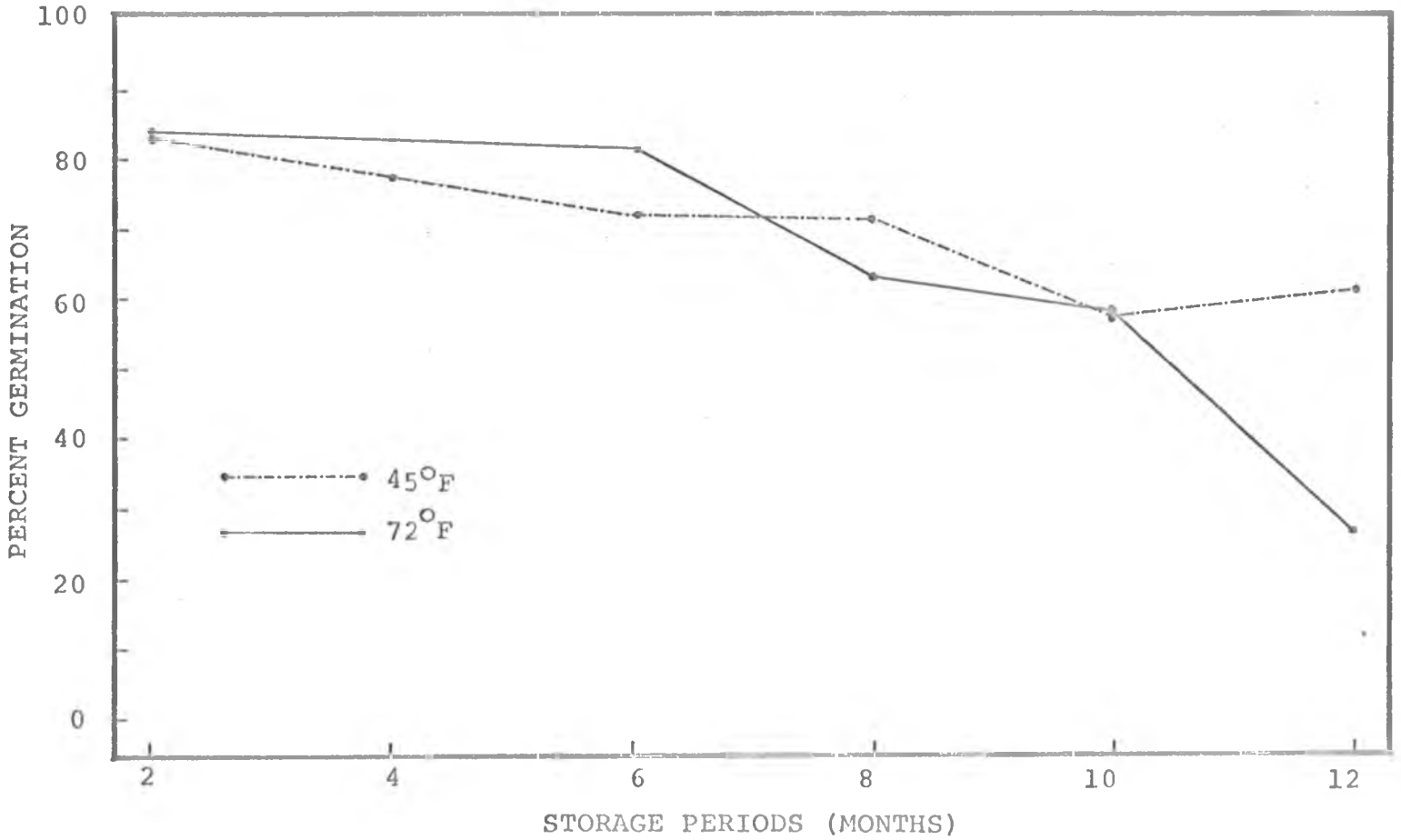

Figure 1. Percent germination of pollen of Dendrobium undulatum stored without dehydrant at 2 temperatures and 6 storage periods.

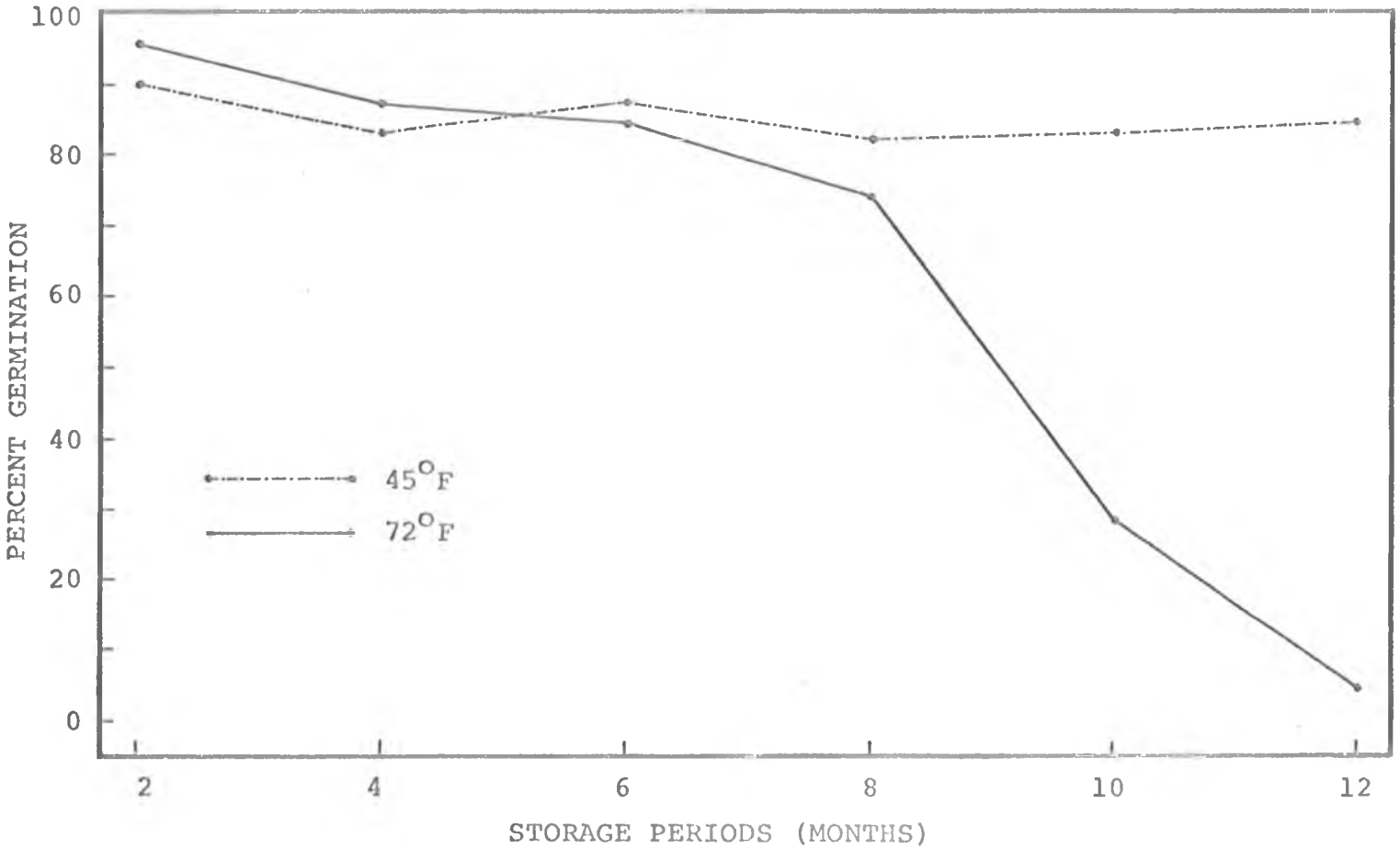

Figure 2. Percent germination of pollen of Dendrobium strebloceras stored without dehydrant at 2 temperatures and 6 storage periods.

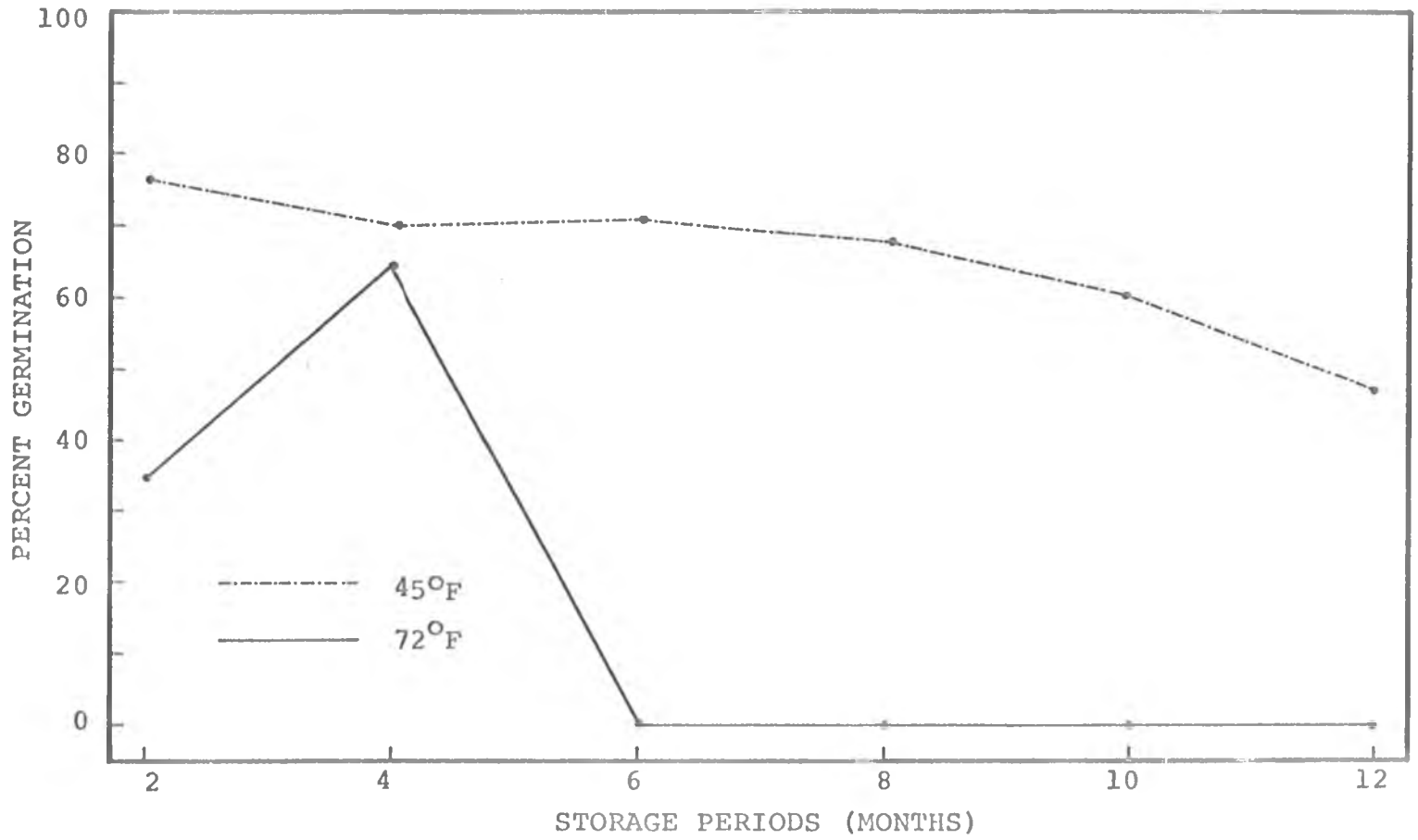

Figure 3. Percent germination of pollen of Dendrobium phalaenopsis x Dendrobium gouldii stored without dehydrant at 2 temperatures and 6 storage periods.

of pollen stored at 45°F dropped gradually in a linear fashion, but even at 12 months the percentage was as high as 46.6 percent. On the other hand, pollen remained viable for only 4 months at 72°F which was comparable in behavior to that of D. phalaenopsis parent.

Germination percentage of pollen of O. stipitatum decreased gradually with increased storage periods at 45°F (Figure 4). At the end of 12 months of storage the germination percentage dropped to 56.1 from the initial 84.6 percent. No germination was obtained at 72°F. The storage temperature of 72°F was too high for the pollen of O. stipitatum to survive.

The following conclusion can be drawn from the results of this investigation. There is a considerable variation in the longevity of pollen among orchids. Dendrobium phalaenopsis retained its viability for only 4 months while the rest of the orchids investigated kept for a year at 45°F. Pollen stored better without the dehydrants, silica gel and calcium chloride. Possibly lesser quantities of dehydrants might have been noninjurious and perhaps effective for maintaining longevity. Pollen retained viability better when stored at 45°F than at 72°F. Although the pollen of D. strebloceras and D. undulatum remained viable after 12 months at 72°F, the viability of O. stipitatum was

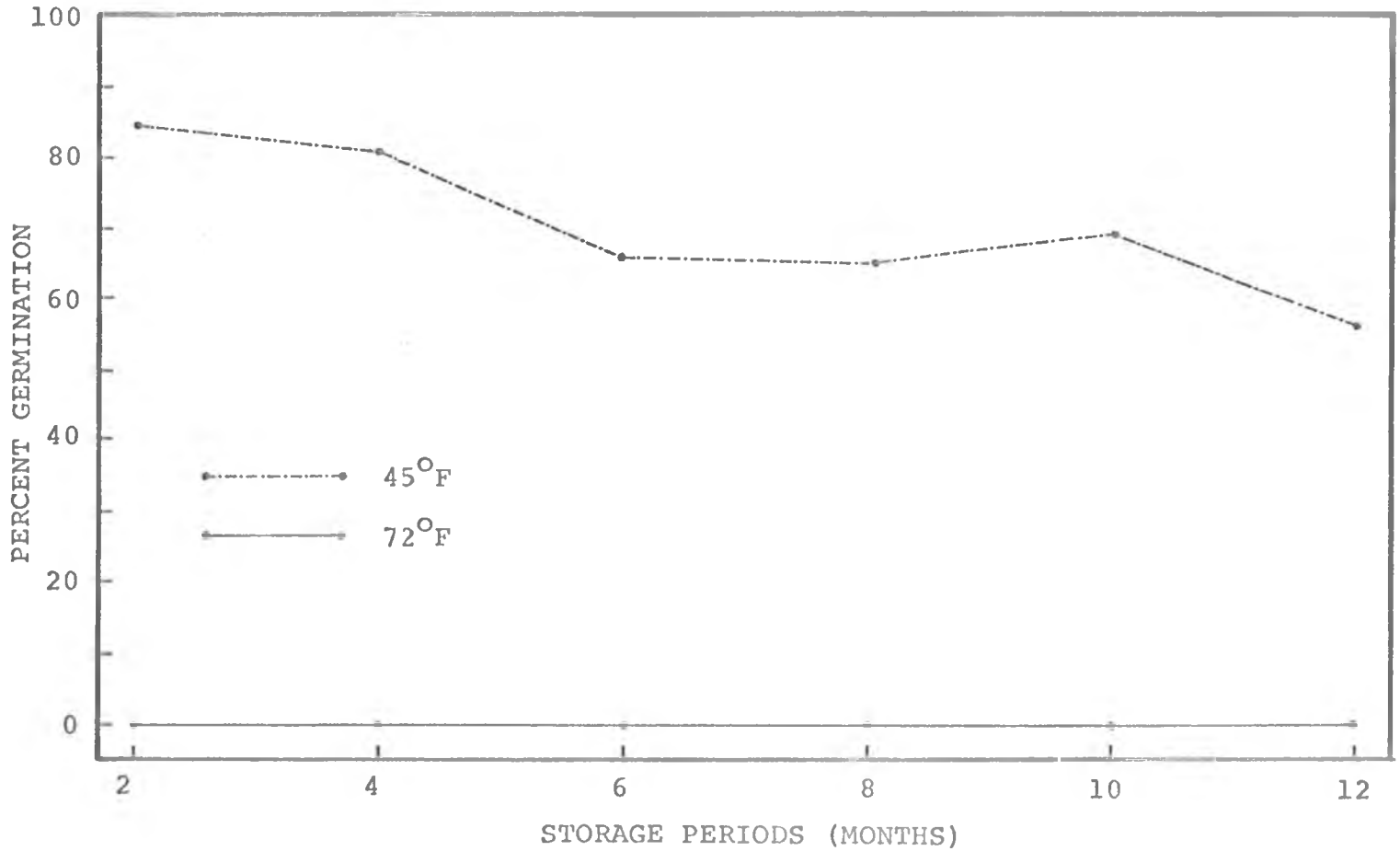

Figure 4. Percent germination of pollen of Oncidium stipitatum stored without dehydrant at 2 temperatures and 6 storage periods.

lost completely at 2 months and that of D. phalaenopsis x D. gouldii at the end of 4 months. Thus, a practical method of extending the longevity of orchid pollen is to store in gelatin capsules without dehydrant at approximately 45°F. With this method, one can expect pollen to keep for a year, which is entirely adequate for the operation of an effective breeding program, since pollen can usually be replaced each year.

SUMMARY

The objective of this investigation was to find a practical way to store orchid pollen. The orchids selected for the study were Dendrobium phalaenopsis, D. undulatum, D. strebloceras, an amphidiploid D. phalaenopsis x D. gouldii, and Oncidium stipitatum.

Pollinia were collected and stored for 2, 4, 6, 8, 10, and 12 months with and without dehydrating agents (silica gel and calcium chloride) at 45°F and 72°F. Germination tests were conducted in vitro in 5 percent sucrose medium with agar as a solidifying agent.

Considerable variation in longevity was encountered for the 5 orchids. D. phalaenopsis pollen had a short life, while those of D. undulatum and D. strebloceras retained their viability for a relatively longer period even at 72°F. O. stipitatum stored well at 45°F, but completely lost its viability upon storage at 72°F.

Pollen stored with silica gel or calcium chloride reduced viability possibly due to excessive dehydration.

With the exception of D. phalaenopsis all orchid pollen stored at 45°F retained their viability for a year. The pollen of D. undulatum and D. strebloceras remained viable after 12 months storage at 72°F, but the germination percentage declined after about the eighth

month in storage. With D. phalaenopsis x D. gouldii and O. stipitatum drastic reduction in germination occurred at 72°F storage.

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